# Building for Tomorrow

## The Indian River Inlet Bridge Newsletter

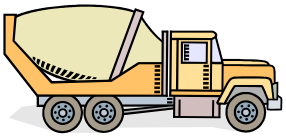
***A publication by the Delaware Department of Transportation (DelDOT)*** ***October 2010***

*Jim Pappas (DelDOT)*

In this issue of *Building for Tomorrow*, we will be examining the importance of concrete to the Indian River Inlet Bridge project, as well as the form traveler that will eventually help to build the roadway over the Indian River Inlet. Even though it makes up a large portion of the project, from the pylon towers to the deck, most people don't give a second thought about concrete. It's all around us in things like sidewalks, buildings, and even light poles, but do you know what goes into making it or where it came from? All of that information and more can be found in this issue.

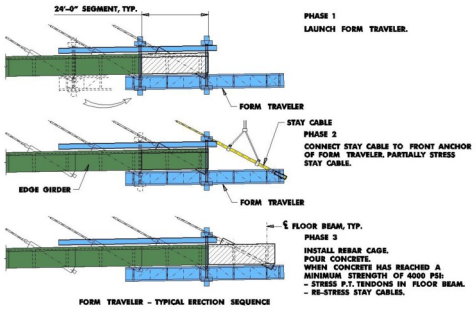
This month's featured guest is Jim Pappas, Assistant Director of Design for the Delaware Department of Transportation (DelDOT). Jim has had a long career with DelDOT and is one of DelDOT's leading authorities on everything concrete. He holds a Bachelor of Science degree in Civil Engineering and oversees the Bridge Design, Quality, and Materials & Research sections of the department.

## The Cold, Hard Truth About Concrete



The development of cementing materials can be traced back to the Egyptians and Romans. The Egyptians used a cement produced by a heating process, and this may have been the start of the technology. Roman engineering upgraded simple lime mortars with the addition of volcanic ash, which increased their durability, as evidenced by the sound structures that are still standing today.

The development of a concrete or cement technology as we know it probably can be traced back to England, where in 1824 Joseph Aspdin produced a Portland cement from a heated mixture of limestone and clay. He was awarded a British patent and the name Portland cement was used because when material hardened, it resembled a stone from the quarries of Portland, England. The production of Portland cement in United States dates back to 1872, when the first Portland cement plant was opened at Coplay, Pennsylvania.

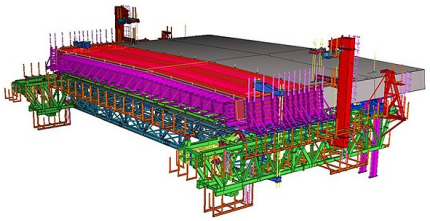



*Artist rendering of how the form traveler operates once it is attached to the deck of the Indian River Inlet Bridge (Skanska USA Civil, Southeast).*

## What Is A Form Traveler?

The form traveler is one aspect of the construction process that fascinates most people when they hear about it. The form traveler is a large piece of equipment that, once assembled and attached to the edge of the bridge deck, will allow the bridge deck to be built over the inlet. The process can be complex, but it is as simple as the traveler locking onto the completed deck area, a new deck area is poured in front of it, and the traveler moves to that edge to begin the process again. This continues until both sides meet in the middle. You can see this process in the renderings to the left.

The form traveler that is going to be used on the bridge was designed and built specifically for this project. When the bridge is complete, the form traveler will be disassembled and recycled. It cannot be used for another project.



*Artist rendering of the form traveler for the Indian River Inlet Bridge (Skanska USA Civil, Southeast).*

## Solid Facts About What Makes Concrete

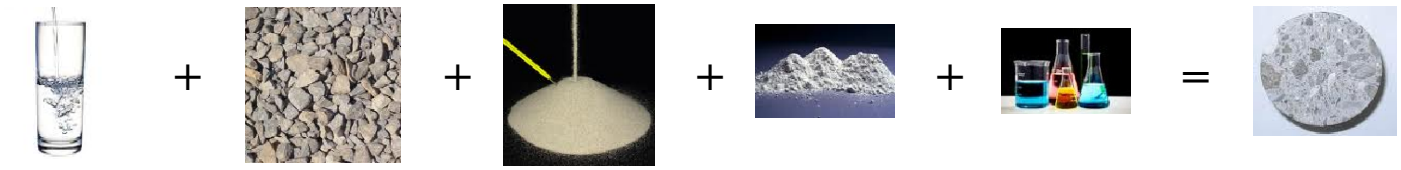
Concrete is like a cake. It's made up of different ingredients, which are mixed together thoroughly and becomes firm when warmed. When making a cake, the wrong quantity of ingredients can ruin the taste of the cake. Just like with the cake, if you put in the wrong amount of the ingredients in a concrete mix it will not turn out the way you planned. We all know that there are many different kinds of cake, chocolate, angel food, marbled, etc. The same is true for concrete; there are many different types of concrete. For example; there is concrete with different kinds of stones in it (gravel or round stone), concrete that is different colors, and you can even create different strengths of concrete.

Basic concrete is a mixture of cement, water, coarse aggregates (stone), and fine aggregates (sand). Concrete mixtures utilized for the bridge construction incorporate supplementary materials such as fly ash (by-product of the combustion of coal), slag cement (by-product of the manufacturing of steel), or silica fume (by-product of the manufacturing of silica) to impart other properties, such as greater strength and better durability of the concrete.

The final "ingredient" we typically add to concrete mixtures are chemical additives. These are a range of chemicals that impart properties to the concrete such as faster strength gain, slower strength gain, freeze/thaw durability, and lowering the water demand and thereby increasing the strength. Any given load of concrete can have a combination of these chemical additives.

When these ingredients are mixed together in the right way they create a thick, liquid concrete.

**BASIC INGREDIENTS FOR CONCRETE**



**WATER + GRAVEL + SAND + CEMENT + CHEMICALS = CONCRETE**

## Concrete: The Ultimate Superhero!

Concrete has the superpower of great strength and there are different types depending on the strength that is needed. At the new Indian River Inlet Bridge, our concrete all looks the same, but we do have different strengths of concrete for different elements on the bridge. The way to tell the strength of concrete is by how many pounds per square inch (psi) it can withstand before cracking. The more psi a concrete section can withstand, the stronger it is.

Concrete can withstand a lot of compressive force. This is force that tries to squeeze or push on the material. A truck parked on a driveway compresses the concrete below it. Various types of concrete on the bridge can withstand a compressive load from 4,500 up to 8,500 pounds per square inch. The weight of a full grown elephant.

**Do you want to see the bridge being built before your eyes?**

**You can view up-to-date time-lapse video that shows construction from the start.**

**Click Here to Visit!**

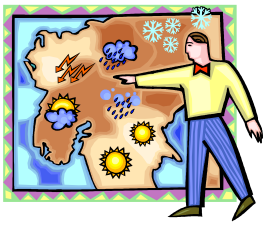
## What Makes Concrete Strong?

If you've ever fallen off of your bicycle or skateboard onto the sidewalk, you know that it hurts. The concrete that makes up the sidewalk, as well as the new Indian River Inlet Bridge, is hard and strong.

Concrete gains its strength through a chemical reaction called hydration. Hydration is when the cement particles and the water come in contact. Heat is generated and bonds start to form between the cement/water paste (mortar) and the aggregates. This hydration process is like placing a fire ball (red hot) in your mouth. When the red hot and saliva come in contact in your mouth, heat gets generated – that's the same thing that happens in concrete. There is also something else that can add even more strength to the concrete to ensure that it lasts a very long time.

*Rebar used in concrete.*

In order to make concrete stronger in tension, which is the force that you place on a rubber band when you stretch it, we add reinforcing steel. This steel forms a type of cage or skeleton for the concrete element. Rebar is categorized by the length of the bar's diameter. The rebar on this job is all different sizes. The biggest bar in the bridge is 1-3/4" diameter.



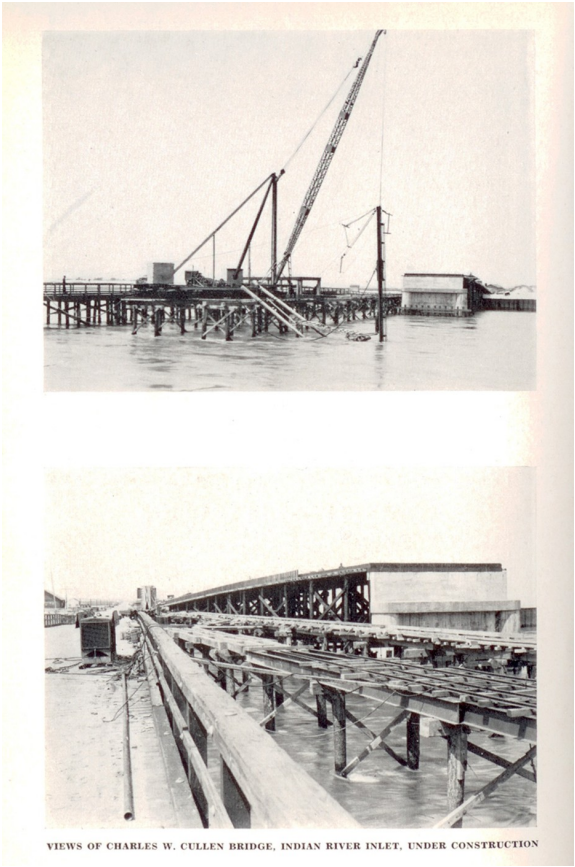
## No Fun In the Sun: How a Beach Day Is a Bad Day for Concrete

With cold days here now, it's nice to think back to summer vacation. You could wake up and go to the beach to get through the hot, summer day. While a hot day is great for you at the beach, it is not good for the men and women who are in charge of spreading concrete for the new Indian River Inlet Bridge.

Environmental conditions have a great affect on concrete, which can pose some problems on the construction site. Since heat is needed for the generation of strength in concrete, weather conditions can play a significant factor in the strength gain and ultimate properties of concrete. For example, in the middle of summer when it is very hot, we'll pour concrete during the night or early mornings to keep the temperature of the concrete lower so the contractor in the field will be able to place it properly. Most of the major concrete pours that have occurred at the Indian River Inlet Bridge have been at night for two reasons. The first is that it keeps construction traffic on Route 1 to a minimum, but it is also to keep the concrete cool during the hot summer.

Conversely, in the winter time when it's cold, the concrete producer will add hot-water to the mixture to try and accelerate the strength gain. Also, in the winter, after placing the concrete, the contractor in the field will have to place insulating blankets over the concrete to keep it from freezing.

## *A Moment of Bridge History*



VIEWS OF CHARLES W. CULLEN BRIDGE, INDIAN RIVER INLET, UNDER CONSTRUCTION

This is a photo of the Charles W. Cullen Bridge from the late 1930s shows the bridge under construction.

The picture on the bottom is of particular interest because it was taken from the first bridge to span the inlet, which was made from creosote timber in 1934.

## Employee Spotlight!

***This is where you get to meet someone who is building the Indian River Inlet Bridge!***

What's your name?: Katherine Stabile

Who do you work for?: DelDOT for 1 1/2 years

What is your job title?: Construction Inspector

Where are you from?: Syracuse, NY

Where do you live now?: Lewes, DE

What are some special skills that you bring to the project?: A Bachelor of Science degree in Civil Engineering from Penn State University in Construction Materials, Minor in Environmental Engineering.

What do you enjoy most about working on this project?: I've enjoyed the experiences and stories that others have shared with me since I started working on the project.

# *Photos from the Job Site*

## *September 2010*

*Final preparations are being made before the form traveler is lifted into position over the Inlet (Skanska USA Civil Southeast).*

*Stay cables with their signature blue covering are installed along the bridge deck (Skanska USA Civil Southeast).*

*A DelDOT employee poses next to a stay cable box to show the size of the boxes that will hold the anchored cables inside of the pylon tower (Skanska USA Civil Southeast).*

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